Characteristics of a High Performance School

High Performance School Buildings Workshop

Martha R. Tarrant AIA, LEED AP BD+C
RossTarrant Architects

National Energy Education Development (NEED) Project

March 22, 2011

Q. What is a High Performance School?

rosstarrant architects

Q. What is a High Performance School?

A. A school that provides a healthy environment for students that is conducive to learning while saving energy, resources & money

High Performance School Goals

- Healthy & Conducive to Learning
  - good indoor air quality
    - 38% less asthma
    - better attendance
  - comfortable environment
  - natural daylight
    - 20-26% better math & reading scores
  - better acoustics

rosstarrant architects

High Performance School Goals

- Energy Efficient
  - high efficiency systems
  - well insulated exterior
  - operate for conservation

rosstarrant architects

High Performance School Goals

- Protects Resources
  - less construction waste
  - less raw materials, more recycled
  - decreased storm water runoff

rosstarrant architects

High Performance School Goals

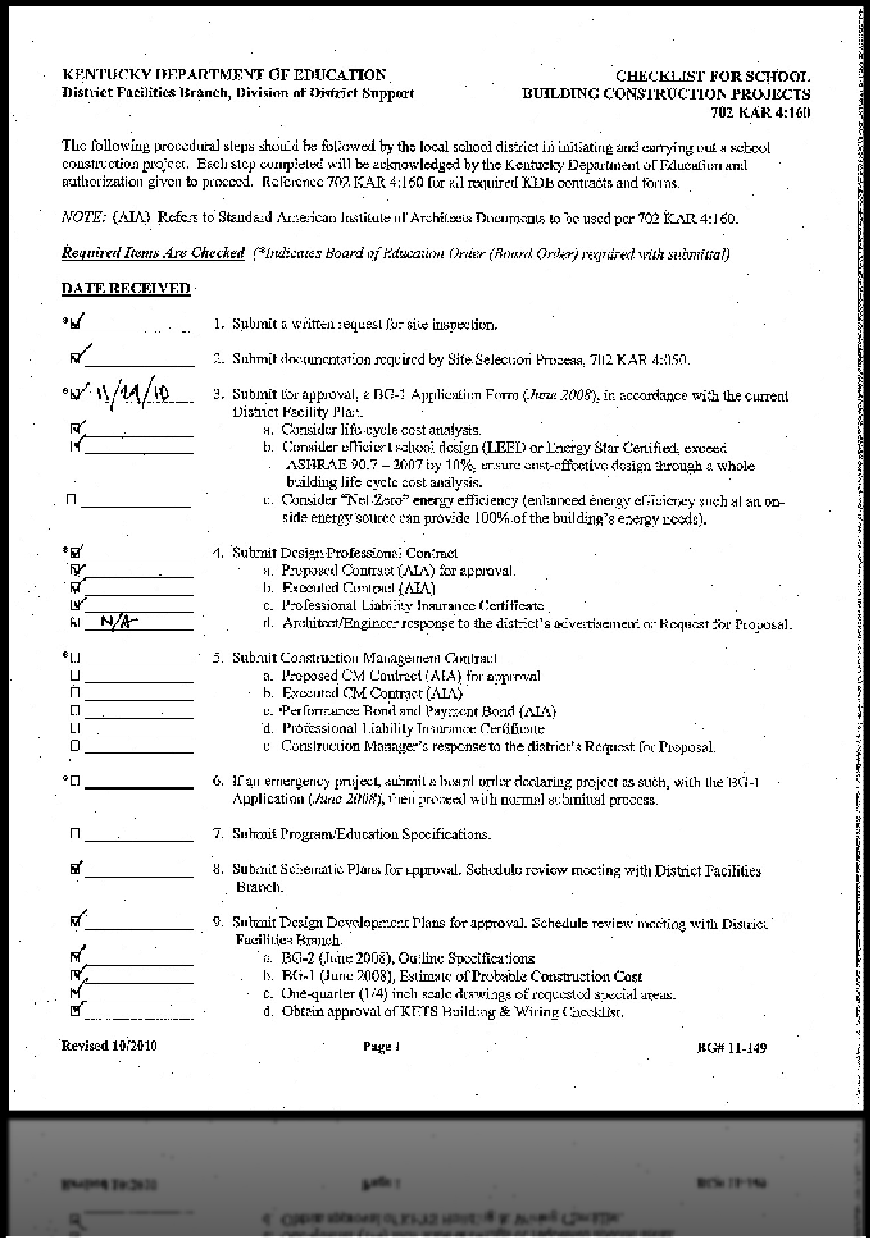
- Saves Money
  - energy
    - 30-40% for new schools ($40,000/year)
    - 20-30% for renovated schools
  - water
    - 30% less
  - maintenance savings

Kentucky Requirements

- KRS 157 (SB 132) passed in 2010
  - Guidelines
    - LEED
    - ENERGY STAR
  - Life cycle cost
  - Energy efficiency
  - Operator training
  - Administrator, faculty & student training
  - Curriculum

Kentucky Requirements

- KDE Checklist



KENTUCKY DEPARTMENT OF EDUCATION
District Facilities Branch, Division of District Support

CHECKLIST FOR SCHOOL BUILDING CONSTRUCTION PROJECTS
702 KAR 4:160

The following procedural steps should be followed by the local school district in initiating and carrying out a school construction project. Each step completed will be acknowledged by the Kentucky Department of Education and authorization given to proceed. Reference 702 KAR 4:160 for all required KDE contracts and forms.

NOTE: (AIA) Refers to Standard American Institute of Architects Documents to be used per 702 KAR 4:160.

Required Items Are Checked (*Indicates Board of Education Order (Board Order) required with submittal)

DATE RECEIVED

1. Submit a written request for site inspection.
2. Submit documentation required by Site Selection Process, 702 KAR 4:050.
3. Submit for approval, a BG-1 Application Form (*June 2008*), in accordance with the current District Facility Plan.
   a. Consider life cycle cost analysis.
   b. Consider efficient school design (LEED or Energy Star Certified, exceed ASHRAE 90.7 – 2007 by 10%, ensure cost-effective design through a whole building life cycle cost analysis.
   c. Consider "Net Zero" energy efficiency (enhanced energy efficiency such at an on-side energy source can provide 100% of the building's energy needs).
4. Submit Design Professional Contract
   a. Proposed Contract (AIA) for approval.
   b. Executed Contract (AIA)
   c. Professional Liability Insurance Certificate
   d. Architect/Engineer response to the district's advertisement or Request for Proposal.
5. Submit Construction Management Contract
   a. Proposed CM Contract (AIA) for approval
   b. Executed CM Contract (AIA)
   c. Performance Bond and Payment Bond (AIA)
   d. Professional Liability Insurance Certificate
   e. Construction Manager's response to the district's Request for Proposal.
6. If an emergency project, submit a board order declaring project as such, with the BG-1 Application (*June 2008*), then proceed with normal submittal process.
7. Submit Program/Education Specifications.
8. Submit Schematic Plans for approval. Schedule review meeting with District Facilities Branch.
9. Submit Design Development Plans for approval. Schedule review meeting with District Facilities Branch.
   a. BG-2 (June 2008), Outline Specifications
   b. BG-1 (June 2008), Estimate of Probable Construction Cost
   c. One-quarter (1/4) inch scale drawings of requested special areas.
   d. Obtain approval of KETS Building & Wiring Checklist.

Revised 10/20/10 Page 1 BGS 11-149

rosstarrant architects

Developing a High Performance School Building

Pathways to High Performance

1. LEED for schools
2. Kentucky Green & Healthy Schools
3. ASHRAE Advanced Energy Design Guide for K-12 School Buildings
4. ENERGY STAR

rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)
   - National standard
   - Third party certification
   - Comprehensive requirements
     - Sustainable site
     - Water efficiency
     - Energy & atmosphere
     - Materials & resources
     - Indoor environmental quality

rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

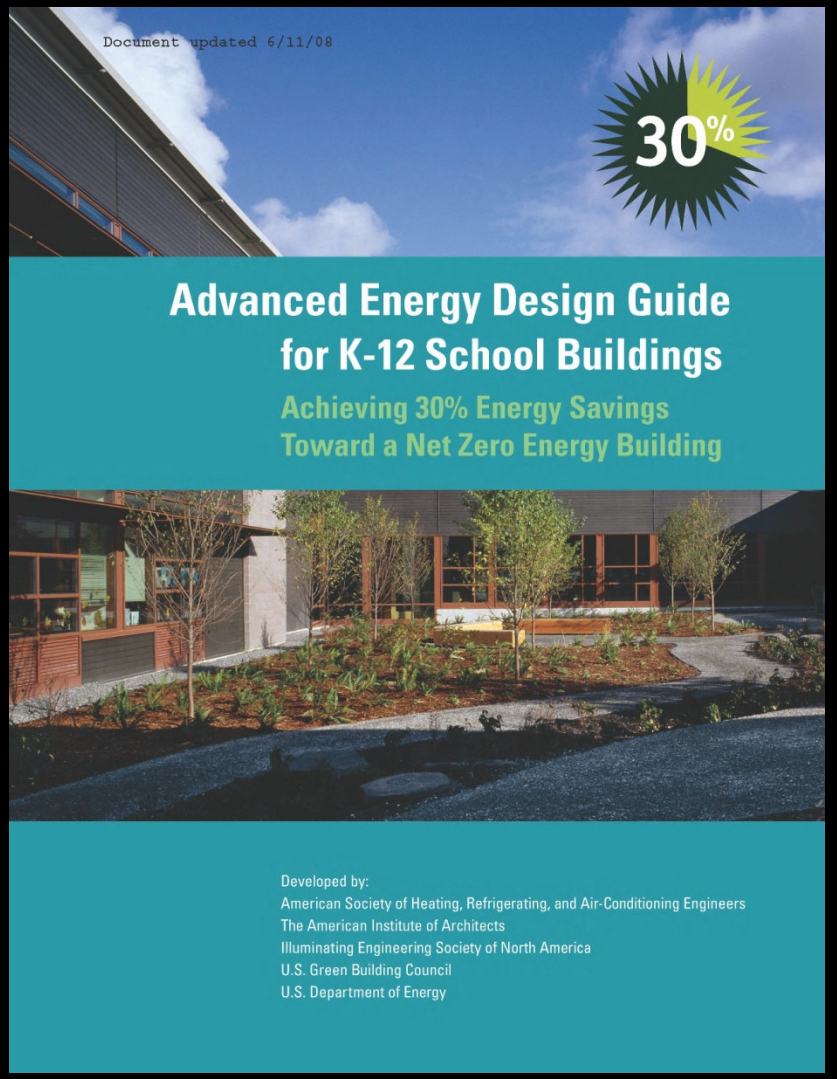
- Kentucky program
- Third party review
- Comprehensive requirements
  - Energy
  - Health & comfort
  - Environment
  - Safe & accessible

rosstarrant architects

Developing a High Performance School Building

3. ASHRAE Advanced Energy Design Guide for K-12 Schools

- Prescriptive how-to approach
- 30% energy savings over ASHRAE 90.1-1999
- Recommended practices
  - Exterior envelope
  - Lighting
  - HVAC
  - Water heating
  - Commissioning

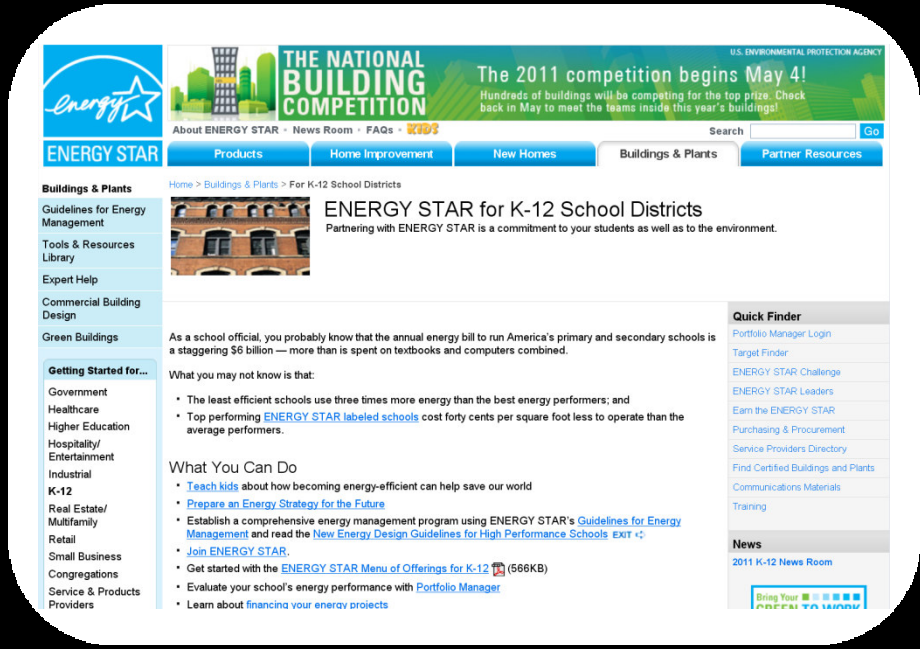


rosstarrant architects

Developing a High Performance School Building

4. ENERGY STAR

- Challenge to reduce energy consumption by 30%
- Recognition for schools achieving top 25% efficiency



rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)
   - Developed by USBGC
   - Used since 2000;
     LEED for Schools launched in 2007
   - Rating system
     (Certified, Silver, Gold, Platinum)
   - Holistic approach

rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)

Points in five categories:

a. Sustainable site
   - site selection
   - development density & community connectivity
   - brownfield redevelopment
   - alternative transportation
   - site development
   - stormwater design
   - heat island effect
   - light pollution
   - site master plan
   - joint use of facilities

rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)

Points in five categories:

b. Water efficiency
   - water efficient landscaping
   - innovative wastewater technologies
   - water use reduction

rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)

Points in five categories:

c. Energy & atmosphere
   - optimize energy performance
   - on-site renewable energy
   - measurement & verification
   - green power

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)

Points in five categories:

d. Materials & resources
   - building reuse
   - construction waste management
   - materials reuse
   - recycled content
   - regional materials
   - rapidly renewable materials
   - certified wood

rosstarrant architects

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)

Points in five categories:

e. Indoor environmental quality

- outdoor air delivery monitoring
- increased ventilation
- construction IAQ management
- low-emitting materials
- indoor chemical & pollutant source control
- controllability of systems
- thermal comfort
- daylight & views
- enhanced acoustical performance
- mold prevention

Developing a High Performance School Building

1. LEED for schools (**L**eadership in **E**nergy & **E**nvironmental **D**esign)
   - Selected features up to design team & owner
   - Some prerequisites
     - construction activity pollution prevention
     - environmental site assessment
     - commissioning
     - minimum energy performance
     - refrigerant management
     - storage & collection of recyclables
     - minimum IAQ
     - tobacco smoke control
     - minimum acoustical performance
   - Third-party verification submitted in design and post-construction

rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

- Recognition for high performance school buildings
- Holistic building design
- Usable resource for school leaders and design teams

rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

20 Criteria in Four Sections:

a. Energy
   - building shell
   - HVAC
   - daylighting
   - electric lighting
   - energy analysis
   - commissioning

rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

20 Criteria in Four Sections:

b. Health & comfort

- visual comfort
- thermal comfort
- acoustic comfort
- indoor air quality

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

20 Criteria in Four Sections:

c. Environment

- environmentally responsive site planning
- water efficiency
- environmentally preferable materials, products & practices
- renewable energy

rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

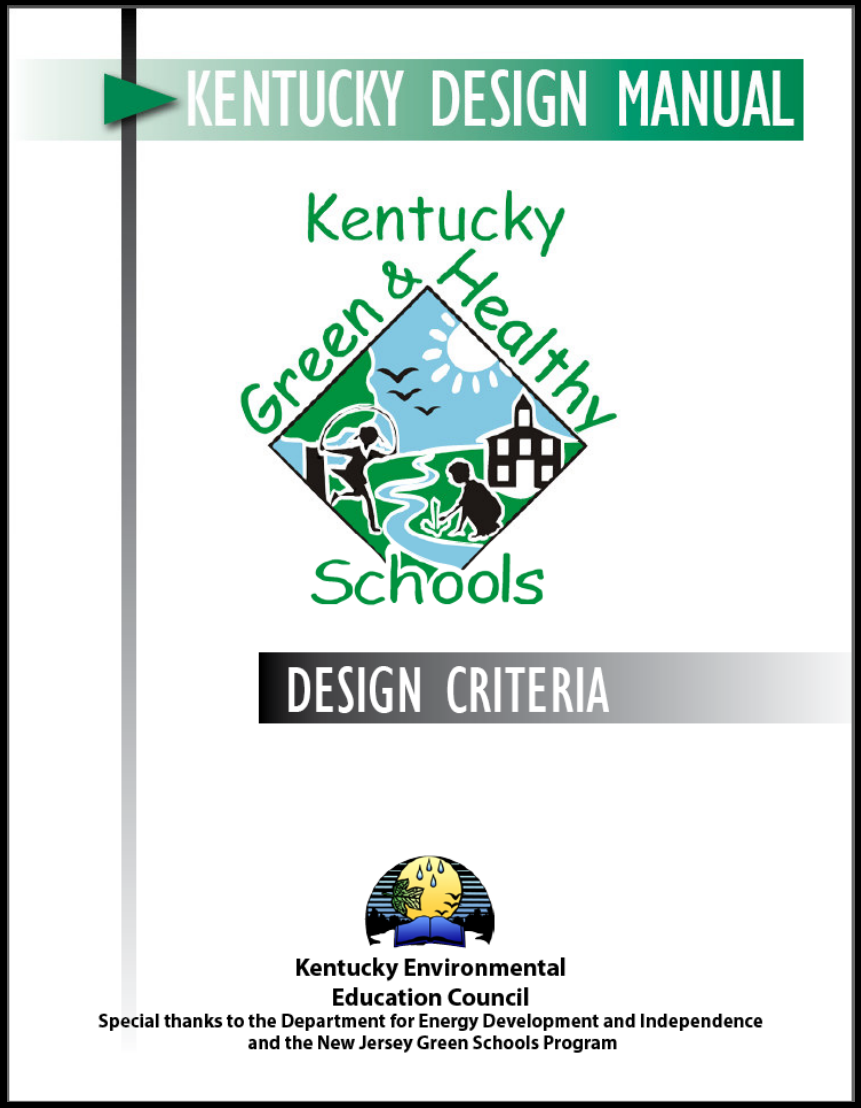
20 Criteria in Four Sections:

d. Safe & accessible
   - flexibility & adaptability
   - safety & security
   - accessibility
   - learning-centered design
   - information technology
   - outdoor learning

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

   - Design Manual Organization
     - what, why, how
     - impact on other systems & technologies
     - recommendations
     - reference standards & guidelines
     - resources
     - criteria checklist



rosstarrant architects

Developing a High Performance School Building

2. Kentucky Green & Healthy Schools

   - How To Be Designated
     - complete Criteria Checklist
     - receive LEED Certification

Developing a High Performance School Building

3. ASHRAE Advanced Energy Design Guide for K-12 Schools

   - 30% savings is first step toward net zero
   - Measures for specific climate zones
   - Energy efficient practices

rosstarrant architects

Developing a High Performance School Building

3. ASHRAE Advanced Energy Design Guide for K-12 Schools

Recommended Practices:

a. Exterior envelope
   - recommended insulation

b. Lighting
   - lighting design recommendations
   - daylighted and non-daylighted options

c. HVAC
   - efficiency ratings for various systems

d. Water heating

e. Commissioning

rosstarrant architects

Developing a High Performance School Building

3. ASHRAE Advanced Energy Design Guide for K-12 Schools

   - Case Studies
     - climate zones

Developing a High Performance School Building

4. ENERGY STAR

- National symbol for energy efficiency
- Developed by US EPA
- Challenges schools to reduce energy usage by 30%
- Recognition for schools achieving top 25%
  - "Designed to Earn the ENERGY STAR"
  - "ENERGY STAR" after one year
  - 100-point scale
  - 75+ earns ENERGY STAR
  - 87 Kentucky schools so far
  - Kentucky is 15th in nation

rosstarrant architects

Developing a High Performance School Building

4. ENERGY STAR

- Target Finder
  - Tool to set goal during design
  - Predict consumption
  - Compare design to target
- Portfolio Manager
  - Existing building benchmarking tool
  - Track consumption
  - Track costs, upgrades, investment cost
  - Track carbon emissions
  - Track water consumption
- Links to other programs

Path to High Performance

- Engage all stakeholders
- Commit to holistic design approach
- Choose a guideline
- Identify goals early
- Commit to energy efficient & sustainable choices

Web Resources

LEED	www.usgbc.org
Kentucky Green & Healthy Schools	www.greenschools.ky.gov
ENERGY STAR	www.energystar.gov
ASHRAE	www.ashrae.org